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Ion irradiation experiments at Oxford University

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Understanding the effect of irradiation with fast neutrons at cryogenic operating temperature on the properties of REBCO HTS is crucial for the design of magnets for fusion tokamaks. However, suitable high flux neutron sources such as fission reactors are not widely available, performing in situ cryogenic measurements in these reactors is challenging, and neutron irradiation activates the samples making experiments slow and expensive. Ion irradiation offers an alternative fast and widely available route to studying irradiation damage in these materials. In Oxford, we have focussed on using helium ions as a proxy for the point defect damage that neutrons produce throughout the lattice, as it is this damage that results in a drop in transition temperature and ultimately the degradation in current carrying performance. Here we will summarise the experiments undertaken by the team in Oxford over the past few years as part of an EPSRC funded research programme are targeted at answering two questions: do neutrons and light ions produce the same point defect landscapes, and what is the effect of temperature on irradiation damage of REBCO HTS?

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